

WHAT IS CLAIMED IS:

1. A lithographic projection apparatus, comprising:
 - a radiation system configured to provide a projection beam of radiation;
 - a support configured to support patterning device, the patterning device configured to pattern the projection beam according to a desired pattern;
 - a substrate table configured to hold a substrate;
 - a projection system configured to project the patterned beam onto a target portion of the substrate; and
 - at least one optical element on which the projection beam is incident having a Si/Mo multilayer structure, a capping layer, and an interlayer comprising C or Mo positioned between the multilayer structure and the capping layer, wherein the interlayer has a thickness of between 6.0 and 9.0 nm.
2. A lithographic projection apparatus according to claim 1, wherein the interlayer thickness is between 6.5 and 8.5 nm.
3. A lithographic projection apparatus according to claim 1, wherein the interlayer thickness is between 7.0 and 8.0 nm.
4. A lithographic projection apparatus according to claim 1, wherein the interlayer comprises Mo and has a thickness of between 6.8 and 8.5 nm.
5. A lithographic projection apparatus according to claim 1, wherein the interlayer comprises Mo and has a thickness of between 7.2 and 8.0 nm.
6. A lithographic projection apparatus according to claim 1, wherein the interlayer comprises C and has a thickness of between 6.5 and 8.2 nm.
7. A lithographic projection apparatus according to claim 1, wherein the interlayer comprises C and has a thickness of between 7.0 and 7.8 nm.
8. A lithographic projection apparatus according to claim 1, wherein the capping layer comprises Ru and has a thickness of between 1.0 and 3.0 nm.
9. A lithographic projection apparatus according to claim 1, wherein the capping layer comprises Ru and has a thickness of between 1.6 and 3.0 nm.
10. A lithographic projection apparatus according to claim 1, wherein the capping layer comprises Ru and has a thickness of at least 2.0 nm.
11. A lithographic projection apparatus according to claim 1, wherein the capping layer comprises Ru and has a thickness of at least 2.2 nm.

12. A lithographic projection apparatus, comprising:
 - a radiation system configured to provide a projection beam of radiation;
 - a support configured to support a patterning device, the patterning device configured to pattern the projection beam according to a desired pattern;
 - a substrate table configured to hold a substrate;
 - a projection system configured to project the patterned beam onto a target portion of the substrate; and
 - at least one optical element on which the projection beam is incident having a Si/Mo multilayer structure, a capping layer, and an interlayer positioned between the multilayer structure and the capping layer, wherein the interlayer comprises an inner interlayer comprising Mo next to the multilayer structure and an outer interlayer comprising C next to the capping layer, the outer interlayer C has a thickness greater than 3.4 nm or the capping layer has a thickness greater than 2.0 nm.
13. A lithographic projection apparatus according to claim 12, wherein the combined thickness of the inner and outer interlayers is between 6.0 and 9.0 nm.
14. A lithographic projection apparatus according to claim 12, wherein the outer interlayer has a thickness greater than 3.5 nm.
15. A lithographic projection apparatus according to claim 12, wherein the outer interlayer has a thickness greater than 3.7 nm.
16. A lithographic projection apparatus according to claim 12, wherein the outer interlayer has a thickness of less than 3.8 nm.
17. A lithographic projection apparatus according to claim 12, wherein the outer interlayer has a thickness of less than 3.4 nm.
18. A lithographic projection apparatus according to claim 12, wherein the capping layer has a thickness greater than 2.1 nm.
19. A lithographic projection apparatus according to claim 12, wherein the capping layer has a thickness greater than 2.2 nm.
20. A lithographic projection apparatus according to claim 12, wherein the inner interlayer has a thickness of between 3.0 and 4.0 nm.
21. A lithographic projection apparatus according to claim 12, wherein the inner interlayer has a thickness of 3.75 nm.

22. A device manufacturing method, comprising:
- providing a substrate that is at least partially covered by a layer of radiation-sensitive material;
 - providing a patterned projection beam of radiation;
 - projecting the patterned beam of radiation onto a target portion of the layer of radiation-sensitive material using at least one optical element on which the projection beam is incident, wherein the at least one optical element has a Si/Mo multilayer structure, a capping layer, and an interlayer comprising C or Mo positioned between the multilayer structure and the capping layer, the interlayer has a thickness of between 6.0 and 9.0 nm.
23. A device manufacturing method, comprising:
- providing a substrate that is at least partially covered by a layer of radiation-sensitive material;
 - providing a patterned projection beam of radiation;
 - projecting the patterned beam of radiation onto a target portion of the layer of radiation-sensitive material using at least one optical element on which the projection beam is incident, wherein the at least one optical element has a Si/Mo multilayer structure, an outer capping layer, and an interlayer positioned between the multilayer structure and the outer capping layer, the interlayer comprises an inner interlayer comprising Mo next to the multilayer structure and an outer interlayer comprising C next to the capping layer, the outer interlayer has a thickness greater than 3.4 nm or the capping layer has a thickness greater than 2.0 nm.
24. An optical element for use in a lithographic projection apparatus, the optical element comprising:
- a Si/Mo multilayer structure;
 - a capping layer; and
 - an interlayer positioned between the multilayer structure and the capping layer, wherein the interlayer comprises one of:
 - a layer comprising C or Mo, the layer having a thickness of between 6.0 and 9.0 nm; and
 - an inner interlayer comprising Mo next to the multilayer structure and an outer interlayer comprising C next to the capping layer, the outer interlayer having a thickness greater than 3.4 nm or the capping layer having a thickness greater than 2.0 nm.